Reviewing sterilization protocols and sterilizers

By Leslie Canham, CDA, RDA
Certified Speaking Professional
Leslie Canham & Associates, LLC

Today, many smart devices automate just about everything. For example, an alarm clock can be set by simply speaking "set my alarm" to a smart phone. Artificial Intelligence also can be used to run household appliances, set a thermostat and even play a song.

But when it comes to sterilization of dental instruments, shortcuts, inattention or missteps can cause breaches in infection control. Therefore, to protect patients and dental workers, specific sterilization protocols must be employed.

Consistently following specific steps can achieve and maintain sterility of dental instruments. One way to do this is to have a written protocol for every step of instrument reprocessing. Once a written protocol is established, it can be distributed to the dental team and posted in the Sterilization Room.

Steps for reprocessing instruments

The first step in proper instrument processing is wearing the right personal protective equipment. A protective gown, clinical jacket or apron, puncture-resistant utility gloves, face mask and protective eyewear are necessary prior to handling contaminated dental instruments. Contaminated instruments should always be transported using a leak-proof tray or tub. Sharp instruments should never be carried by hand.

Cleaning should be done as soon as possible to remove blood and bioburden. This should be done before they have a chance to dry and harden on the instruments. Prompt cleaning also minimizes staining, corrosion and pitting that can occur when instruments are soiled. If instruments cannot be cleaned immediately, a pre-treatment – such as soaking instruments in an enzymatic cleaning solution or applying an enzymatic spray or gel – should be considered.

Cleaning can be performed most efficiently by placing contaminated instruments in an automated cleaning system, such as an ultrasonic unit or an instrument washer. The manufacturer's instructions for use (IFU) – including type of detergent, dilution, water quality, length of time to operate unit and temperature – should always be followed.

If an automated cleaning system is not available, manual cleaning must be performed. Instruments should be placed in a tub of cleaning solution. It is best to use a cleaning solution designed for dental instruments to avoid damage. After soaking to loosen bioburden, a long-handled scrub brush should be used to remove debris. Using a long-handled brush allows instruments to be immersed during scrubbing (to minimize splashes) while keeping hands above the waterline and away from sharp instrument ends.

After cleaning and rinsing, instruments should be visually inspected for residual debris. If blood, saliva and other contamination are not removed, these materials can shield microorganisms and potentially compromise the disinfection or sterilization process. If an instrument needs repair or is damaged, it should be set aside to be evaluated by the employer or supervisor.

After cleaning and inspection, instruments should be dry before being packaged or wrapped for sterilization. Hinged instruments should be opened and unlocked to allow the sterilizing agent to circulate and "touch" all surfaces.

CDC Guidelines for Infection Control in Dental Health-Care Settings – 2003 state that instruments should be inspected before being packed or wrapped and placed in the sterilizer: "Cleaned instruments and other dental supplies should be inspected, assembled into sets or trays, and wrapped, packaged, or placed into container systems for sterilization. Packaging materials (e.g., wraps or container systems) allow penetration of the sterilization agent and maintain sterility of the processed item after sterilization. Materials for maintaining sterility of instruments during transport and storage include wrapped perforated instrument cassettes, peel pouches of plastic or paper, and sterilization wraps (i.e., woven and nonwoven). Packaging materials should be designed for the type of sterilization process being used."

Proper materials for wrapping, packaging

Different types of materials are used for packaging instruments. The sterilizer manufacturer IFUs should be checked to determine the proper type of wrap or pouch to use. Using the wrong types of sterilization packaging

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material can hinder achieving sterilization. The following are some common pitfalls of using the wrong type of wrap or pouch for a sterilizer:

- Some packaging may prevent the sterilizing agent from reaching the instruments inside.
- Some plastics may melt.
- Some paper may burn or char.
- Thick cloths may absorb too much steam.
- Closed containers are not appropriate for steam or unsaturated chemical vapor sterilizers.
- Cloths absorb too much chemical vapor.
- Lint fibers may cause postoperative complication and serve as vehicles for microorganisms, increasing the risk of infection for surgical patients.

Sterilization of unwrapped instruments

An unwrapped cycle (sometimes called flash sterilization) is a method for sterilizing unwrapped patient-care items for immediate use. Unwrapped sterilization should be used only under certain conditions: 1) thorough cleaning and drying of instruments precedes the unwrapped sterilization cycle; 2) mechanical monitors are checked and chemical indicators are used for each cycle; 3) care is taken to avoid thermal injury to dental workers or patients; and 4) items are transported aseptically to the point of use to maintain sterility.

To avoid getting poked with a contaminated instrument, dental workers should wear puncture-resistant utility gloves while cleaning and packaging or wrapping instruments prior to sterilization. In addition, careful handling of contaminated instruments includes techniques such as making sure all instruments are fully inside the sterilization pouch when sealing as well as ensuring they are properly placed in the cassette before closing.

Sterilizer options

A sterilizer should be used according to the manufacturer's IFU to ensure the sterilizer performs properly. The three types of sterilizers most commonly used in dental practices are:

- Steam sterilization (autoclave)
- Dry heat sterilization
- Unsaturated chemical vapor

Autoclaves use steam and are either "gravity displacement" or "pre-vacuum" type sterilizers. Temperatures reach approximately 250° F to 273° F. Sterilization times range from four to 30 minutes depending on temperature, whether instruments are wrapped or unwrapped and the manufacturer's instructions for use. The "drying cycle" may be 25 to 40 minutes.

Dry heat sterilizers are either "static air" or "forced air." The high heat and extended time are the major factors in achieving sterilization. Temperatures reach approximately 300° F to 375° F. Sterilization times vary from 12 to 150 minutes, depending on temperature and manufacturer's instructions.

Unsaturated chemical vapor sterilizers use a combination of alcohol, formaldehyde, ketone, acetone and water to create a vapor for sterilizing. The combination of pressure, temperature and time are the major factors in achieving sterilization. Pressure should measure 20 psi; temperatures should reach 270° F, and sterilization time is approximately 20 to 40 minutes.

All devices used for heat sterilization of dental instruments must be medical sterilization equipment that has been cleared for market by the FDA. The manufacturer's instructions should always be followed for sterilization times, temperatures and other operating parameters as

Common pitfalls encountered when trying to achieve sterilization of instruments

Hazards to sterilization include:

- Inadequate pre-cleaning of instruments
- Improper packaging
- Bulky packaging
- Overloading the sterilizer
- Inadequate spacing of instruments
- Interrupting the sterilization cycle
- Inadequate time, temperature or pressure
- Inadequate drying cycle (autoclaves)
- Faulty gaskets or seals
- Improper operation of unit
- Operator error by inattention

When it comes to achieving sterilization of dental instruments, precise steps must be taken. A written protocol for reprocessing dental instruments can help standardize the steps and create consistency in a team's performance. Patient safety and the reputation of the practice depend on achieving and maintaining sterility of instruments.

The CDC provides guidance, checklists and resources for infection control in dental healthcare settings. Some state dental boards adopt the CDC guidelines while other states have their own separate infection control regulations. State dental boards have information on infection control regulations. A complimentary copy of an "Instrument Processing Protocol" can be received by sending an email to office@lesliecanham.com.

well as instructions for correct use of containers, wraps and chemical or biological indicators. Use of toaster ovens or glass bead sterilizers are not considered acceptable devices for sterilization of dental instruments and could jeopardize patient safety.

Practicing sterility assurance

Sterility assurance is the correct performance of the proper instrument processing steps and monitoring of the sterilization step with biologic, mechanical and chemical indicators, according to *Infection Control and Management of Hazardous Materials for the Dental Team 4th*. Biological indicators (BIs) are the most accepted means of monitoring the sterilization process because they directly determine whether the most resistant microorganisms (e.g., Geobacillus or Bacillus species) are present, rather than merely determining whether the physical and chemical conditions necessary for sterilization are met. Because spores used in BIs are more resistant and present in greater numbers than the common microbial contaminants found on patient care equipment, an inactivated BI indicates that other potential pathogens in the load also have been killed.

Mechanical techniques for monitoring sterilization include assessing the cycle time, temperature and pressure of the sterilization equipment by observing the gauges or displays on the sterilizer.

Chemical indicators (internal and external) use sensitive chemicals to assess physical conditions, such as temperature, during the sterilization process. Chemical indicators, such as heat-sensitive tape, change color rapidly when a given parameter is reached (i.e., temperature). An internal chemical indicator should be placed in every sterilization package to ensure the sterilization agent has penetrated the packaging material and actually reached the instruments inside.

An external indicator should be used when the internal indicator cannot be seen from outside the package. Single-parameter internal indicators provide information on only one sterilization parameter and are available for steam, dry heat and unsaturated chemical vapor. Multi-parameter internal indicators measure two to three parameters and can provide a more reliable indication that sterilization conditions have been met. Multi-parameter internal indicators are only available for steam sterilizers (i.e., autoclaves). Manufacturer instructions should be referred to for proper use and placement of chemical indicators.

Correct functioning of sterilization cycles should be verified for each sterilizer by the periodic use (at least weekly) of BIs. Two ways to process the biological monitors are in-office

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monitoring and mail-in monitoring. In-office monitoring systems allow testing the sterilizer and obtaining the results in 24 hours or less. Mail-in monitoring services can take up to a week to get results. A report of the results is sent back to the dental office.

In the event of a sterilization failure, immediate action must be taken to determine the reason for the failure. The sterilizer should be taken out of service until the cause of the failure can be determined and corrected. Any items processed after the last successful spore test may not have been sterilized, so they will need to be repackaged and re-sterilized in a properly functioning sterilizer. Putting the date of sterilization and which sterilizer was used on the instrument pouches or cassettes helps in identifying which items need to be reprocessed.

Maintaining sterility

The sterilization bag or pouch should always be sealed at the perforation. When a bag or pouch is folded below the perforation, such as folding it in half, the opening of the package will not be sealed – therefore, instruments will not maintain sterility inside the package. Most sterilization bags are either self-sealing or heat-sealed. Safety pins, staples or paper clips should never be used to seal the bag or pouch.

For sterilization bags that are not self- or heat-sealed, chemical indicator tape should be used to seal the package. Cassettes wrapped in sterilization wrap should be examined for tears or holes before and after being sterilized.

Disposable sterilization bags, pouches or wraps are single-use items, unless otherwise indicated. Instruments

are considered sterile inside a sterilized sealed pouch indefinitely, unless an event compromises the package. Events that could compromise sterility include opening the pouch, instruments poking through the pouch, torn or punctured package or wrap, allowing wet packages to come in contact with contaminated surfaces or placing a sterile package in an area where it could become moist or wet. ■

This is number 169 in a series of articles on practice management and marketing for oral and maxillofacial surgeons developed under the auspices of the Committee on Practice Management and Professional Staff Development and AAOMS staff. Practice Management Notes from 2002 to present are available online at AAOMS.org.

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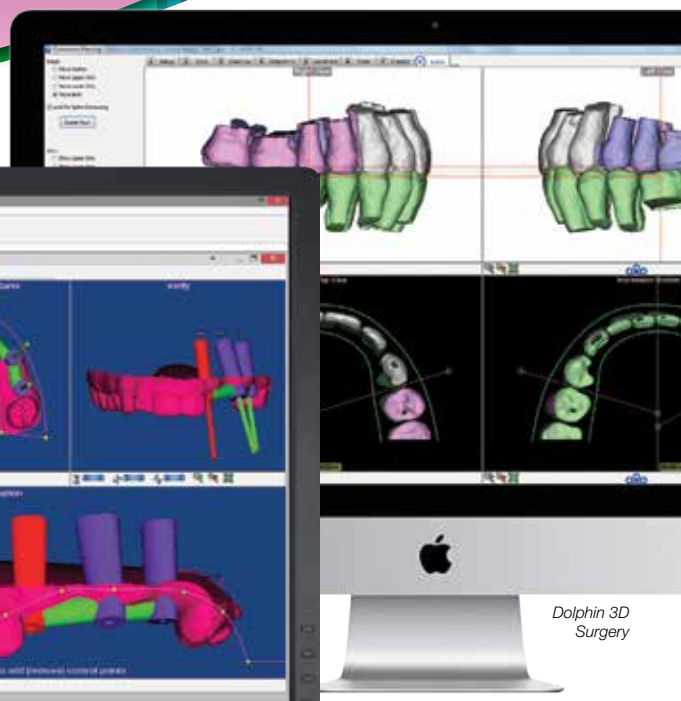

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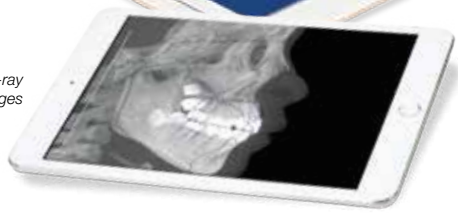

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